PATENT ABSTRACTS OF JAPAN

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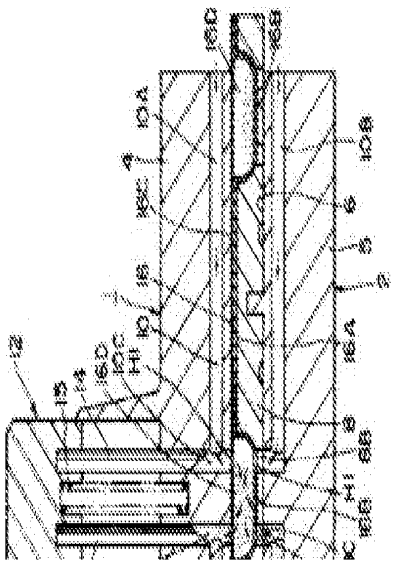
(54) INHALATION TYPE MEDICINE ADMINISTERING TOOL

(57)Abstract:

PROBLEM TO BE SOLVED: To administer a specified amount of medicinal powder stored in a medicinal powder storing part to a patient by diffusing and atomizing the medicinal powder in the medicinal powder storing part of a blister pack.

SOLUTION: A constitution wherein a perforating tool 12 with two pins 14 and 14 for perforation is provided on a body 2 and a blister pack is perforated by means of the perforating tool 12 is provided. Therefore, as inlet holes H1 communicating with inlet side ventilating passages 10 and outlet holes H2 communicating with outlet side ventilating passages 11 can be made on the blister pack 16 by means of the pins 14 and 14 of the perforating tool 12, turbulence is generated in the medicinal powder storing part 16D by air flow flowing from the inlet holes H1 toward the outlet holes H2 and the medicinal powder in the medicine powder storing part 16D can be diffused and atomized by this



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I, Satoru Kakeno, residing at 1-2, Saiwai 2-chome, Ichikawa-shi, Chiba 272-0123, Japan, and working for ISP Corporation of 1-29, Akashi-cho, Chuo-ku, Tokyo 104-0044, Japan, fully conversant with the English and Japanese languages, do hereby certify that to the best of my knowledge and belief the following is a true translation of Japanese Patent Application No. 11-352281 filed in the Japanese Patent Office on the 10th day of December, 1999 in respect of an application for Letters Patent.

Signed, this 2nd day of June, 2006

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[DOCUMENT NAME] SPECIFICATION

[Title of the Invention] INHALANT MEDICATOR

[Scope of Claim for Patent]

[Claim 1] An inhalant medicator comprising:

a medicator body including a holder mounting portion at one axial end and an inhalant port at the other axial end for inhalation of medical powder;

a holder detachably rotatably mounted to the holder mounting portion and holding thereon a blister pack having a plurality of medical powder storage chambers spaced apart from each other in a circumferential direction thereof;

the medicator body having a portion defining an inflow air passage to supply atmosphere toward one of the plurality of medical powder storage chambers of the blister pack held on the holder which is mounted on the holder mounting portion;

the medicator body having a portion defining an outflow air passage to flow out the medical powder stored in the one medical powder storage chamber of the blister pack held on the holder toward the inhalant port; and

a pricking tool attached to the medicator body to prick an inflow hole and an outflow hole in the one medical powder storage chamber of the blister pack, so that the inflow hole is fluidly communicated with the inflow air passageway and the outflow hole is fluidly communicated with the outflow air passageway.

[Claim 2] The inhalant medicator as claimed in claim 1, which further comprises a positioning means provided between the holder mounting portion of the medicator body

and the holder, for positioning the one medical powder storage chamber of the blister pack held on the holder at a pricking position of the pricking tool.

[Claim 3] The inhalant medicator as claimed in claims 1 or 2, wherein the holder mounting portion of the medicator body comprises upper and lower medicator-body portions and a joining portion through which the upper and lower medicator-body portions are formed integral with each other, and the upper and lower medicator-body portions define therebetween a holder mounting groove which opens to three directions, and the holder comprises a disc-shaped holder so that the disc-shaped holder is inserted into and removed from within the holder mounting groove.

[Claim 4] The inhalant medicator as claimed in claims 1, 2, or 3, wherein the holder mounting portion of the medicator body has a protruded portion that is a center of rotation of the holder, and the holder has a plurality of recessed fit portions each of which is formed on an upside of the holder and is fitted to one of the plurality of medical powder storage chambers of the blister pack, and the holder has a portion defining a guide groove that is formed on an underside of the holder to guide the protruded portion to the center of rotation of the holder.

[Detailed Description of the Invention]

[0001]

[Field of the Invention]

The present invention relates to an inhalant medicator suitable to prescribe granular or powdered

medicines toward within lungs of a patient by way of breathing action of the patient.

[0002]

[Prior Art]

Of these medications for an asthmatic patient, an inhalant medicator used for an inhalation treatment where a dose of medical powder encapsulated in a capsule is inhaled, is generally constructed by a medicator body including a capsule housing chamber at one axial end and equipped at the other axial end with an inhalant port through which the medical powder is inhaled, an air passageway communicating the inhalant port with the atmosphere via the capsule housing chamber, and a pricking tool provided for pricking holes in the capsule accommodated in the capsule housing chamber.

[0003]

There have been proposed and developed various inhalant medicators utilizing a blister pack having a set of blisters or a plurality of blistered medical powder storage chambers spaced apart from each other in the circumferential direction, for inhalant medication. Such inhalant medicators have been disclosed in Japanese Patent Provisional Publication Nos. 59-88158 and 62-41668.

[0004]

The prior art inhalant medicator includes a blister pack holder, which holds a blister pack. The blister pack holder is configured to be rotatably mounted on a medicator body.

[0005]

In order to prescribe the medical powder toward within lungs of the patient, holes needed to intercommunicate the atmospheric side and the inhalant port via the internal space of the medical powder storage chamber of the blister pack installed at the pricking position (prescribing position) are pricked by means of a single plunger having a needle-shaped pricking tip. Under these conditions, when the patient draws his or her breath while taking the inhalant port in his or her mouth, air flow directed from the pricked holes through the medical powder storage chamber into the inhalant port enables medical powder stored in the medical powder storage chamber to be carried via the inhalant port into lungs of the patient.

[0006]

In order to continuously perform inhalant medication, the blister pack is rotated by a predetermined angle together with the blister pack holder, and then the next medical powder storage chamber of the same blister pack is set at the pricking position. Thereafter, in the same manner described previously, a series of inhalant medication procedures are made. Thus, it is possible to consecutively dose a patient with a specified amount of medical powder by rotation of the blister pack holder without exchanging a capsule.

[0007]

[Task solved by the Invention]

However, in the previously described prior art inhalant medicators, in order to prick holes in the medical powder storage chamber of the blister pack, a single

plunger is used as the pricking tool. Thus, two holes, straightly penetrating the medical powder storage chamber, are pricked or pierced in the medical powder storage chamber of the blister pack. Air introduced into the medical powder storage chamber flows straight through the medical powder storage chamber from one of the two pricked holes to the other.

[0008]

Therefore, it is impossible to adequately diffuse medical powder in the medical powder storage chamber by way of such straight airflow and thus some medical powder may be undesirably left in the medical powder storage chamber. As a result of this, the patient cannot inhale a specified amount of medical powder into the lungs, thus lowering medical benefits of powdered or granular medicines.

[0009]

The present invention has been made to solve the aforementioned disadvantages of the prior art, and accordingly an object thereof is to provide an inhalant medicator, which is capable of prescribing a specified amount of medical powder toward within lungs of a patient, while satisfactorily diffusing the medical powder stored in a medical powder storage chamber of a blister pack.

[0010]

[Means to solve the Task]

In order to accomplish the aforementioned objects of the present invention, an inhalant medicator as recited in claim 1 comprises a medicator body including a holder mounting portion at one axial end and an inhalant port

at the other axial end for inhalation of medical powder, a holder detachably rotatably mounted to the holder mounting portion and holding thereon a blister pack having a plurality of medical powder storage chambers spaced apart from each other in a circumferential direction thereof, the medicator body having a portion defining an inflow air passage to supply atmosphere toward one of the plurality of medical powder storage chambers of the blister pack held on the holder which is mounted on the holder mounting portion, the medicator body having a portion defining an outflow air passage to flow out the medical powder stored in the one medical powder storage chamber of the blister pack held on the holder toward the inhalant port, and a pricking tool attached to the medicator body to prick an inflow hole and an outflow hole in the one medical powder storage chamber of the blister pack, so that the inflow hole is fluidly communicated with the inflow air passageway and the outflow hole is fluidly communicated with the outflow air passageway.

[0011]

With the previously noted arrangement, the holder holds the blister pack in place. The holder is mounted on the holder-mounting portion of the medicator body. Then, one of the plurality of medical powder storage chambers of the blister back is mounted on and attached to the pricking position of the pricking tool. By means of the pricking tool, an inflow hole fluidly communicated with the inflow air passageway and an outflow hole fluidly communicated with the outflow air passageway are pricked

in the one medical powder storage chamber. Under these conditions, when the patient draws his or her breath while taking the inhalant port in his or her mouth, atmosphere flows through the inflow air passageway and the inflow hole into the medical powder storage chamber, and thus medical power/air mixture containing medical powder is carried through the inflow hole, the outflow air passageway via the inhalant port into lungs of the patient.

[0012]

During inhaling operation of medical powder, air flowing via the inflow hole toward the outflow hole is not directed straight, but brought into collision with the inner wall of the medical powder storage chamber. Turbulent flow is thus produced within the medical powder storage chamber. Therefore, it is possible to effectively diffuse or micronize medical powder stored in the medical powder storage chamber by virtue of the turbulent flow. As a result of this, it is possible to efficiently feed almost all of medical powder stored in the medical powder storage chamber into the inhalant port.

[0013]

According to the invention as recited in claim 2, a positioning means is further provided between the holder mounting portion of the medicator body and the holder, for positioning one of the medical powder storage chambers of the blister pack held on the holder at a pricking position of the pricking tool.

[0014]

With the previously-noted arrangement, the holder, conditioned in the blister pack holding state, is attached

to the holder mounting portion of the medicator body. When rotating the holder with respect to the medicator body, the positioning means stops rotary motion of the holder when the one medical power storage chamber is positioned at the pricking position of the pricking tool, so as to position the medical power storage chamber at the pricking position.

[0015]

According to the invention as recited in claim 3, the holder mounting portion of the medicator body comprises upper and lower medicator-body portions and a joining portion through which the upper and lower medicator-body portions are formed integral with each other, and the upper and lower medicator-body portions define therebetween a holder mounting groove which opens to three directions, and the holder comprises a disc-shaped holder so that the disc-shaped holder is inserted into and removed from within the holder mounting groove.

[0016]

With the previously-noted arrangement, it is possible to easily form the holder mounting portion only by forming the holder mounting groove between the upper and lower medicator-body portions. It is possible to easily construct the inhalant medicator by inserting the disc-shaped blister pack holder into the holder mounting groove, thus reducing the number of component parts.

[0017]

According to the invention as recited in claim 4, the holder mounting portion of the medicator body has

a protruded portion that is a center of rotation of the holder, and the holder has a plurality of recessed fit portions each of which is formed on an upside of the holder and is fitted to one of the plurality of medical powder storage chambers of the blister pack, and the holder has a portion defining a guide groove that is formed on an underside of the holder to guide the protruded portion to the center of rotation of the holder.

[0018]

With the previously-noted arrangement, it is possible to integrally position the blister pack with respect to the holder by installing the blister pack on the upside of the holder and by fitting the medical power storage chambers to the respective recessed fit portions, thus allowing the blister pack 16 to integrally rotate together with the holder 8. Additionally, in attaching the holder to the holder mounting portion of the medicator body, the guide groove formed on the underside of the holder is engaged with the protruded portion of holder mounting groove and the holder is inserted into the holder mounting groove under a condition where the guide groove is fitted to the protruded portion, with the result that the guide groove permits the protruded portion to be easily guided to the rotation center of the holder.

[0019]

[Description of the Preferred Embodiments]

Hereinafter described in detail with reference to Figs. 1 to 11 is the embodiment of the invention.

[0020]

Reference sign 1 denotes an inhalant medicator assembly. The inhalant medicator assembly 1 is mainly constructed by a medicator body 2 (described later) and an inhalant port 7 (described later).

[0021]

Reference sign 2 denotes the medicator body including a holder mounting portion of the inhalant medicator assembly 1. As shown in Figs. 3 and 4, the medicator body 2 is constructed by integrally connecting upper and lower medicator-body portions 4 and 5. The medicator body 2 is comprised of a substantially cylindrical joining portion 3 into which an inhalant port 7 is installed, a substantially semi-circular upper medicator-body portion 4 extending axially from the joining portion 3, a substantially semi-circular lower medicator-body portion 5 spaced apart from the underside of the upper medicator-body portion 4 by a clearance space and extending axially from the joining portion 3, a holder mounting groove 6 defined between the upper and lower medicator-body portions 4 and 5. As a whole, the medicator body is substantially cylindrical in shape. Also, the joining portion 3 is formed on its inner periphery with an internal thread portion 3A into which the inhalant port 7 is screwed. On the other hand, the upper medicator-body portion 4 is formed on the outer periphery with a pricking tool guide 4A capable of slidably supporting a support portion 13 of a pricking tool 12 (described later).

[0022]

Reference sign 6 denotes a holder mounting groove formed in medicator body 2. The holder mounting groove 6 is defined in the medicator body by three surfaces, namely a groove innermost end surface 6A forming part of the joining portion 3, the ceiling wall surface 6B corresponding to the underside of upper medicator-body portion 4, and the bottom surface 6C corresponding to the upside of lower medicator-body portion 5. And thus, the holder mounting groove 6 is formed to open to three directions, that is, leftwards and rightwards, and in one axial direction of the medicator body. The innermost end surface 6A of the groove is formed into a concave circular-arc shape that fits the contour of the outer periphery of a blister pack holder 8. Additionally, the aperture defined between the ceiling wall surface 6B and the bottom surface 6C is dimensioned to be somewhat greater than the thickness dimension of the holder 8.

[0023]

The medicator body is formed with a protruded portion 6D extending upwards from a substantially central portion of the bottom surface 6C of holder mounting groove 6. The central protruded portion 6D functions as a center of rotation of the blister pack holder 8. The protruded portion 6D is engaged with a guide groove 8E (described later).

[0024]

Reference sign 7 denotes an inhalant port that is installed on the joining portion 3 of medicator body 2. The inhalant port 7 is formed on its outer periphery with an external screw portion 7A. The top end of inhalant

port 7 is configured in a manner so as to gradually diametrically small-sized. The root portion of inhalant port 7 is formed with a plurality of radially-extending auxiliary air passageways 7B, 7B, ... (only two auxiliary air passageways are shown in the drawing for the purpose of illustrative simplicity). Each of the auxiliary air passageways 7B serves to avoid the difficulty in breathing action by increasing a quantity of air flowing into inhalant port 7 of the inhalant medicator during the breathing action through inhalant port 7. Inhalant port 7 is installed on the medicator body by screwing the external thread portion 7A into the internal thread portion 3A of joining portion 3.

[0025]

Reference sign 8 denotes the holder 8 that is detachably rotatably mounted into the holder mounting groove 6 of medicator body 2. As clearly shown in Figs. 6 and 7, the holder 8 has a substantially disc shape. The holder 8 is formed on its upside with eight recessed fit portions 8A, 8A, ..., 8A circumferentially spaced apart from each other by 45 degrees and located near its circumference. In the shown embodiment, eight recessed fit portions 8A are configured or formed as eight radially-elongated, substantially semi-cylindrical cavities. Eight blistered portions 16B of blister pack 16 (described later) are integrally fitted into the respective eight recessed fit portions of the holder. The holder is formed in each of recessed fit portions 8A with an inflow pin insertion hole or a radially inward pin insertion hole 8B and an outflow pin insertion hole

or a radially-outward pin insertion hole 8C spaced apart from each other in the radial direction of the holder 8.

[0026]

The holder 8 is also formed on its underside with eight recessed fit portions 8D, 8D, ..., 8D located inside of inflow pin insertion holes 8B and circumferentially spaced apart from each other by 45 degrees, taking into account the installation positions of pin insertion holes 8B and 8C. In the shown embodiment, spherical ball portions 9B included in a positioning mechanism 9 (described later) are fitted to one diametrically-opposed pair 8D of the eight recessed fit portions. Furthermore, the holder 8 is also formed on the underside with the guide groove 8E radially extending from the center of rotation of the holder 8. The guide groove 8E is formed to guide the protruded portion 6D of the holder mounting groove 6 toward the center of rotation of the holder 8.

[0027]

The holder 8 is rotatably mounted into the holder mounting groove 6 in accordance with the following procedures. First, the guide groove 8E is engaged with the central protruded portion 6D under a condition where the blister pack 16 is installed on and fitted to the upside of the holder. Thereafter, the holder installing thereon the blister pack, is inserted into the holder mounting groove, until the innermost end of the guide groove reaches the protruded portion.

[0028]

Reference sign 9 denotes a positioning mechanism (see Fig. 5) serving as the positioning means provided in the medicator body 2. As shown in Figs. 4 and 5, the positioning mechanism 9 includes two spring-loaded ball housing bores 9A, 9A each closed at one end, point-symmetrical with respect to the protruded portion 6D in such a manner as to sandwich therebetween the central protruded portion, and formed in the bottom surface 6C (lower medicator-body portion 5) of holder mounting groove 6. The positioning mechanism 9 also includes two spring-loaded spherical balls 9B, 9B housed in the respective ball housing bores 9A, 9A in an unremovable fashion so that the inside diameter of the opening end of each spring-loaded ball housing bore is slightly less than the inside diameter of the other portion of the bore, and two coil springs 9C, 9C operably disposed in the respective ball housing bores 9A, 9A in a manner so as to permanently bias the balls 9B, 9B in their protrusion directions.

[0029]

With the previously-noted arrangement of the positioning mechanism 9, when the holder 8 is rotated under a condition where the holder 8 has been mounted into the holder mounting groove 6, the two spring-loaded balls 9B can be brought into engagement with the respective recessed fit portions 8D of the holder 8. By way of the engagement between the two spring-loaded balls and the recessed fit portions with the rotary motion of the holder, one of radially-elongated recessed fit portions 8A (that is, one of medical powder storage chambers 16D of blister

pack 16) is efficiently positioned in a predetermined pricking position of the pricking tool 12, that is, in a set inhalation position for inhalant medication.

[0030]

Reference sign 10 denotes an inflow air passageway formed in the medicator body 2. The inflow air passageway 10 is provided to permit the atmosphere outside air to be introduced or directed toward within the recessed fit portion 8A of the holder 8. Also, the inflow air passageway 10 includes an upper axially-extending air passage 10A which is bored or formed in the upper medicator-body portion 4, and whose one axial end opens at one axial end of the upper medicator-body portion 4 to the atmosphere. In a similar manner, the inflow air passageway also includes a lower axially-extending air passage 10B which is bored or formed in the lower medicator-body portion 5, and whose one axial end opens at one axial end of the lower medicator-body portion 5 to the atmosphere. The inflow air passageway also includes a radially-extending pin insertion hole 10C formed in the medicator body so that the pin insertion hole radially extends from the pricking tool guide 4A via the upper medicator-body portion 4 toward the lower medicator-body portion 5. The radially-extending pin insertion hole is fluidly communicated with the other axial end of each of the upper and lower axially-extending air passages 10A and 10B. The pin insertion hole 10C is configured to be able to communicate with the inflow pin insertion hole 8B of the holder 8, when one of the recessed fit portions of the holder is positioned in the pricking position.

[0031]

Reference sign 11 denotes an outflow air passageway formed in the medicator body 2. The outflow air passageway 11 is provided to permit medical powder stored in the medical powder storage chamber 16D of the blister pack 16 to flow into the inhalant port 7. The outflow air passageway 11 includes a pin insertion hole 11A radially extending in parallel with the pin insertion hole 10C of the inflow air passageway 10, an upper outflow air passage 11B, and a lower outflow air passage 11C. The upper outflow air passage axially extends from the upper medicator-body portion 4 via the joining portion 3 toward the inhalant port. One axial end of the upper outflow air passage is fluidly communicated with the pin insertion hole 11A, whereas the other axial end opens to the interior space of the inhalant port 7. In a similar manner, one axial end of the lower outflow air passage is fluidly communicated with the pin insertion hole 11A, whereas the other axial end opens to the interior space of the inhalant port 7.

[0032]

Reference sign 12 denotes the pricking tool used to prick holes in the blister pack 16. As shown in Fig. 1, the pricking tool 12 includes the support portion 13 whose outer periphery is slidably supported or guided by a cylindrical inner peripheral wall of the pricking tool guide 4A, and a pair of parallel pins 14, 14 whose root portions are fixedly connected to the support portion 13, and whose tips are inserted into the respective pin insertion holes 10C and 11A. The pricking tool also

includes a return spring 15 disposed between the support portion 13 and the upper medicator-body portion 4 for permanently biasing the support portion and the pins toward their initial positions.

[0033]

When pushing the support portion 13 of pricking tool 12 into the pricking tool guide 4A against the bias of the spring 15, and thus the two pins 14, 14 are inserted into the respective pin insertion holes 10C and 11A. Thus, the tips of pins 14, 14 penetrate the blister pack 16. As a result of this, two inflow holes or two inflow ports H1 and two outflow holes or two outflow ports H2 are pricked respectively in the blistered portion 16B of a base panel 16A and a lid panel 16C of blister pack 16 (see Figs. 10 and 11). As detailed hereunder, eight blistered portions of the base panel define eight medical powder storage chambers 16D in conjunction with the lid panel. After pricking, as soon as the pushing force applied to the support portion 13 is removed, the support portion 13 and the two pins 14, 14 are returned back to their initial positions by way of the spring bias.

[0034]

On the other hand, reference sign 16 denotes the blister pack 16, which is applicable to the inhalant medicator of the first embodiment. As shown in Figs. 8 and 9, blister pack 16 is comprised of base panel 16A having a thin-walled disc shape and made of synthetic resin or the like and having a plurality of blistered portions 16B around its entire circumference, and lid panel 16C affixed onto the principal surface or the obverse

of base panel 16A, and having a thin-walled disc shape and made of synthetic resin, aluminum material or the like. The blistered portions 16B formed in the base panel 16A are located near the circumference of the base panel 16A, and formed as eight radially-elongated, substantially semi-cylindrical convex portions. The eight blistered portions are circumferentially spaced apart from each other by 45 degrees.

[0035]

By hermetically covering or closing the blistered portions 16B by the lid panel 16C, medical powder storage chambers 16D are defined between the blistered portions 16B of the base panel and the lid panel 16C. Also, a predetermined amount of medical powder, such as granular medicine or powdered medicine is stored in each of the medical powder storage chambers 16D.

[0036]

The inhalant medicator of the first embodiment is constructed as previously discussed. Hereinbelow described in detail in reference to the drawings are the preliminary operation of inhalant medication through which a patient inhales medical powder, and the flow of air and the flow of medical powder during inhalation.

[0037]

First, the holder is removed from the holder mounting groove 6 of medicator body 2. During removal of the holder, the guide groove 8E, formed in the underside of the holder 8, must be aligned with respect to the axis of the medicator body under a condition in which the outermost end of guide groove faces the inhalant port 7. Then, the holder 8 can

be removed from the medicator body by pulling the holder against the bias produced by the positioning mechanism 9.

[0038]

Then, blister pack 16 is fitted to and installed on the upside of holder 8. At this time, by fitting the blistered portions 16B (the medical powder storage chambers 16D) of the blister pack 16 to the respective recessed fit portions 8A of the holder 8, the blister pack 16 can be integrally connected to and positioned with respect to the holder 8, and thus the blister pack and the holder are rotatable together with each other.

[0039]

After the blister pack 16 has been installed on the holder 8, the holder 8 is mounted into the holder mounting groove 6. In this case, the guide groove 8E must be aligned with the axis of the medicator body so that the outermost end of the guide groove is directed toward the inhalant port 7, and also the protruded portion 6D must be engaged with the guide groove 8E so as to push the holder 8into holder guide groove 6. In this manner, after the holder 8 has been completely pushed into the holder mounting groove until the innermost end of the guide groove engages with the protruded portion, balls 9B, 9B of the positioning mechanism 9 are engaged with the recessed fit portions 8D of the holder 8 by rotating the holder 8 in an arbitrary direction. By way of a series of preliminary setting operations as discussed above, as shown in Fig. 9, it is possible to accurately position one of the medical powder storage chambers 16D of blister pack 16 at the

predetermined pricking position (the set inhalation position of medical powder).

[0040]

Hereunder described in detail is the actual operation of inhalant medication made by virtue of breathing action of a patient. First, in order to prick holes in the blister pack 16 held at the predetermined pricking position, the support portion 13 of pricking tool 12 is pushed or depressed. As shown in Figs. 10 and 11, two opposed inflow holes H1 communicating inflow air passageway 10 are pricked in the blistered portion 16B and in the lid panel 16C by means of one of the two pins 14 inserted into the pin insertion hole, and at the same time two opposed outflow holes H2 communicating outflow air passageway 11 are pricked in the blistered portion 16B and in the lid panel 16C by means of the other pin 14 inserted into the pin insertion hole. As a result, the medical powder storage chamber 16D of blister pack 16 is communicated through the inflow holes H1 with the inflow air passageway 10, and also communicated through the outflow holes H2 with the outflow air passageway 11.

[0041]

Under these conditions, when the patient draws his or her breath while taking the inhalant port 7 in his or her mouth, air passes through the inflow air passageway 10 via the two inflow holes H1 and then flows into the medical powder storage chamber 16D. At this time, the air flow introduced via the inflow holes H1 into the medical powder storage chamber 16D is brought into collision with the inner wall surface of medical powder storage chamber

16D, because the inflow holes H1 and the outflow holes H2 are spaced apart from each other in the axial direction, thereby resulting in turbulent flow within the medical powder storage chamber. Thus, the medical powder stored in the chamber can be effectively diffused or micronized. As a consequence, it is possible to effectively flow out almost all of the medical powder pre-stored in the storage chamber 16D through the outflow holes H2 and the outflow air passageway 11 into the inhalant port 7 by virtue of the turbulent flow. As discussed above, during breathing action, the patient can inhale a specified amount of medical powder via his or her oral cavity and trachea into lungs with the aid of the turbulent flow.

[0042]

In this manner, the first inhalant medication can be completed. Subsequently to the above, when the second inhalant medication is needed, the holder 8 is first rotated from the current angular position by 45 degrees. The adjacent, next diametrically-opposed recessed fit portions 8D of holder are thus engaged with the balls 9B of the positioning mechanism 9. After this, through the previously-noted pricking operation and inhaling operation, it is possible to continuously inhale medical powder. In this manner, eight inhalant medications in total can be continuously made. Thereafter, the holder 8 is removed from the medicator body, and then the old blister pack 16 is replaced with a new blister pack for the next inhalation medication.

[0043]

As set forth above, according to the inhalant medicator of the first embodiment, the inflow holes H1 communicating the inflow air passageway 10 and the outflow holes H2 communicating the outflow air passageway 11 can be formed or pricked in the blister pack 16 by means of two pins 14, 14 fixedly connected to the pricking tool 12, so that the inflow holes H1 and the outflow holes H2 are spaced apart from each other. As a result of this, air flowing via the inflow holes toward the outflow holes is not directed straight, but brought into collision with the inner wall of the medical powder storage chamber. Turbulent flow is thus produced within the medical powder storage chamber 16D by the air flow directed from two inflow holes via the internal space of the medical powder storage chamber to two outflow holes. Therefore, it is possible to effectively diffuse or micronize medical powder stored in the medical powder storage chamber 16D by virtue of the turbulent flow occurring in the medical powder storage chamber. As a result of this, it is possible to efficiently reliably prescribe a specified amount of medical powder pre-stored in one of storage chambers 16D into lungs of a patient by way of breathing action. This enhances medical benefits of the medical powder, thereby enhancing the reliability of the inhalant medicator.

[0044]

Furthermore, the holder 8 is formed on its underside with the recessed fit portions 8D, and additionally the positioning mechanism 9 is provided in the holder mounting groove 6 for positioning the medical powder storage chamber 16D of blister pack 16 at the predetermined

pricking position (the set position for inhalant medication) of pricking tool 12 by fitting the balls to the recessed fit portions 8D. Thus, it is possible to easily accurately position the medical powder storage chamber 16D of blister pack 16 at the predetermined pricking position. In other words, it is possible to accurately prick holes in the blistered portion, thus ensuring easy handling of the inhalant medicator.

[0045]

Moreover, in the inhalant medicator assembly 1 of the first embodiment, the medicator body 2 is constructed by not only upper and lower medicator-body portions 4 and 5, but also joining portion 3 interconnecting the upper and lower medicator-body portions, and also the holder mounting groove 6 is simply defined between the upper and lower medicator-body portions 4 and 5. The inhalant medicator of the embodiment is designed to be easily assembled by mounting the disc-shaped blister pack holder 8 into the holder mounting groove 6 being simple in structure, thus reducing the number of parts of the inhalant medicator assembly. This ensures ease of assembly, and also reduces total production costs of the inhalant medicator.

[0046]

Additionally, the holder 8 is formed on its upside with circumferentially equally spaced, radially-elongated eight recessed fit portions 8A. Thus, it is possible to accurately easily position the blister pack 16 on the holder 8 by fitting the blistered portions 16B to the respective recessed fit portions 8A, thus

allowing the blister pack 16 to integrally rotate together with the holder 8. This ensures ease of handling.
[0047]

In addition to the above, the holder 8 is formed on its underside with the guide groove 8E, which is engageable with the protruded portion 6D of holder mounting groove 6. The guide groove 8E permits the protruded portion 6D to be reliably easily guided to the rotation center of the holder 8. This ensures accurate and easy mounting of the holder 8 on the desired position of the medicator body 2, thus ensuring ease of handling.
[0048]

In the embodiment shown and described herein, although the inhalant medicator is exemplified in the blister pack 16 having eight blistered portions 16B (or eight medical powder storage chambers 16D) circumferentially spaced from each other, the invention is not limited to the particular embodiments shown and described herein. In lieu thereof, a blister pack having two or more and seven or less blistered portions, or a blister pack having nine or more blistered portions may be used in the inhalant medication. In this case, the number of the recessed fit portions 8A of the holder 8, the number of the pin insertion hole pairs 8B, 8C, and the number of recessed fit portions 8D must be set to be identical to the number of the blistered portions.
[0049]

[Effects of the Invention]

As explained previously, according to the invention as recited in claim 1, an inhalant medicator comprises

a medicator body including a holder mounting portion at one axial end and an inhalant port at the other axial end for inhalation of medical powder, a holder detachably rotatably mounted to the holder mounting portion and holding thereon a blister pack having a plurality of medical powder storage chambers spaced apart from each other in a circumferential direction thereof, the medicator body having a portion defining an inflow air passage to supply atmosphere toward one of the plurality of medical powder storage chambers of the blister pack held on the holder which is mounted on the holder mounting portion, the medicator body having a portion defining an outflow air passage to flow out the medical powder stored in the one medical powder storage chamber of the blister pack held on the holder toward the inhalant port, and a pricking tool attached to the medicator body to prick an inflow hole and an outflow hole in the one medical powder storage chamber of the blister pack, so that the inflow hole is fluidly communicated with the inflow air passageway and the outflow hole is fluidly communicated with the outflow air passageway.

[0050]

Therefore, with the previously-noted arrangement, the holder, holding the blister pack in place, is mounted on the holder mounting portion of the medicator body. Then, one of the plurality of medical power storage chambers of the blister pack is mounted on and attached to the pricking portion of the pricking tool, and thus inflow holes fluidly communicating with the inflow air passageway and outflow holes fluidly communicating with

the outflow air passageway can be pricked in the one medical powder storage chamber. Under these conditions, when the patient draws his or her breath while taking the inhalant port in his or her mouth, atmosphere flows through the inflow air passageway and the inflow hole into the medical powder storage chamber, and thus medical powder/air mixture containing medical powder is carried through the inflow hole, the outflow air passageway via the inhalant port into lungs of the patient.

[0051]

During inhaling operation of medical powder, air flowing via the inflow hole toward the outflow hole is not directed straight, but brought into collision with the inner wall of the medical powder storage chamber. Turbulent flow is thus produced within the medical powder storage chamber. Therefore, it is possible to effectively diffuse or micronize medical powder stored in the medical powder storage chamber by virtue of the turbulent flow. Thus, it is possible to effectively feed almost all of medical powder into the inhalant port. As a result of this, it is possible to efficiently reliably prescribe a specified amount of medical powder pre-stored in one of the medical powder storage chambers into lungs of a patient by way of breathing action. This enhances medical benefits of the medical powder, thereby enhancing the reliability of the inhalant medicator.

[0052]

According to the invention as recite in claim 2, a positioning means is further provided between the holder mounting portion of the medicator body and the holder,

for positioning the one medical powder storage chamber of the blister pack held on the holder at a pricking position of the pricking tool. Thus, the holder, conditioned in the blister pack holding state, is attached to the holder mounting portion of the medicator body. When rotating the holder with respect to the medicator body, it is possible to accurately easily position the medical power storage chamber at the pricking position by means of the positioning means. This ensures the accurate pricking action and ease of handling.

[0053]

According to the invention as recited in claim 3, the holder mounting portion of the medicator body comprises upper and lower medicator-body portions and a joining portion through which the upper and lower medicator-body portions are formed integral with each other, and the upper and lower medicator-body portions define therebetween a holder mounting groove which opens to three directions, and the holder comprises a disc-shaped holder so that the disc-shaped holder is inserted into and removed from within the holder mounting groove. Thus, it is possible to easily form the holder mounting portion only by forming the holder mounting groove between the upper and lower medicator-body portions. It is possible to easily construct the inhalant medicator by inserting the disc-shaped blister pack holder into the holder mounting groove, thus reducing the number of component parts. This ensures the ease of assembling and reduced costs.

[0054]

According to the invention as recited in claim 4, the holder mounting portion of the medicator body has a protruded portion that is a center of rotation of the holder, and the holder has a plurality of recessed fit portions each of which is formed on an upside of the holder and is fitted to one of the plurality of medical powder storage chambers of the blister pack, and the holder has a portion defining a guide groove that is formed on an underside of the holder to guide the protruded portion to the center of rotation of the holder. Thus, it is possible to integrally position the blister pack with respect to the holder by installing the blister pack on the upside of the holder and by fitting the medical power storage chambers to the respective recessed fit portions, thus allowing the blister pack 16 to integrally rotate together with the holder 8, thus enabling both of the holder and the blister pack to integrally rotate together, and enhancing the ease of handling. Additionally, in attaching the holder to the holder mounting portion of the medicator body, the guide groove formed on the underside of the holder is engaged with the protruded portion of holder mounting groove and the holder is inserted into the holder mounting groove under a condition where the guide groove is fitted to the protruded portion, with the result that the guide groove permits the protruded portion to be accurately easily guided to the rotation center of the holder. This enhances the ease of handling.

[Brief Description of the Drawings]

[Figure 1]

FIG. 1 is a longitudinal cross-sectional view illustrating one embodiment of an inhalant medicator of the invention.

[Figure 2]

FIG. 2 is a plan view illustrating the inhalant medicator of the embodiment, made according to the invention.

[Figure 3]

FIG. 3 is a longitudinal cross-sectional view illustrating details of only a medicator body of the inhalant medicator shown in Fig. 1.

[Figure 4]

FIG. 4 is a longitudinal cross-sectional view of the medicator body, taken along the line IV - IV shown in Fig. 3.

[Figure 5]

FIG. 5 is a lateral cross-sectional view illustrating the medicator body and a positioning mechanism, taken along the line V - V of Fig. 1.

[Figure 6]

FIG. 6 is a plan view illustrating only a blister pack holder.

[Figure 7]

FIG. 7 is a bottom view illustrating only the blister pack holder.

[Figure 8]

FIG. 8 is a perspective view of only a blister pack, as viewed from its bottom side.

[Figure 9]

FIG. 9 is a longitudinal cross-sectional view illustrating the inhalant medicator in a state where the blister pack is held on the holder and then the holder is mounted in a holder mounting groove formed in the medicator body.

[Figure 10]

FIG. 10 is a longitudinal cross-sectional view illustrating the inhalant medicator in a state where medical powder stored in the storage chamber of the blister pack is inhaled.

[Figure 11]

FIG. 11 is a partly enlarged longitudinal cross-sectional view showing airflow and medical powder flow in the medical powder storage chamber of the blister pack.

[Description of Reference Signs]

1	Inhalant Medicator Assembly
2	Medicator Body (Holder Mounting Portion)
4	Upper Medicator-body Portion
5	Lower Medicator-body Portion
6	Holder Mounting Groove
6D	Protruded Portion
7	Inhalant Port
8	Holder
8A	Recessed Fit Portion
8E	Guide Groove
9	Positioning Mechanism (Positioning Means)
10	Inflow Air Passageway
11	Outflow Air Passageway
12	Pricking Tool

	14	Pin
	16	Blister Pack
	16D	Medical Powder Storage Chamber
	H1	Inflow Hole
5	H2	Outflow Hole

[DOCUMENT NAME] ABSTRACT

[Abstract]

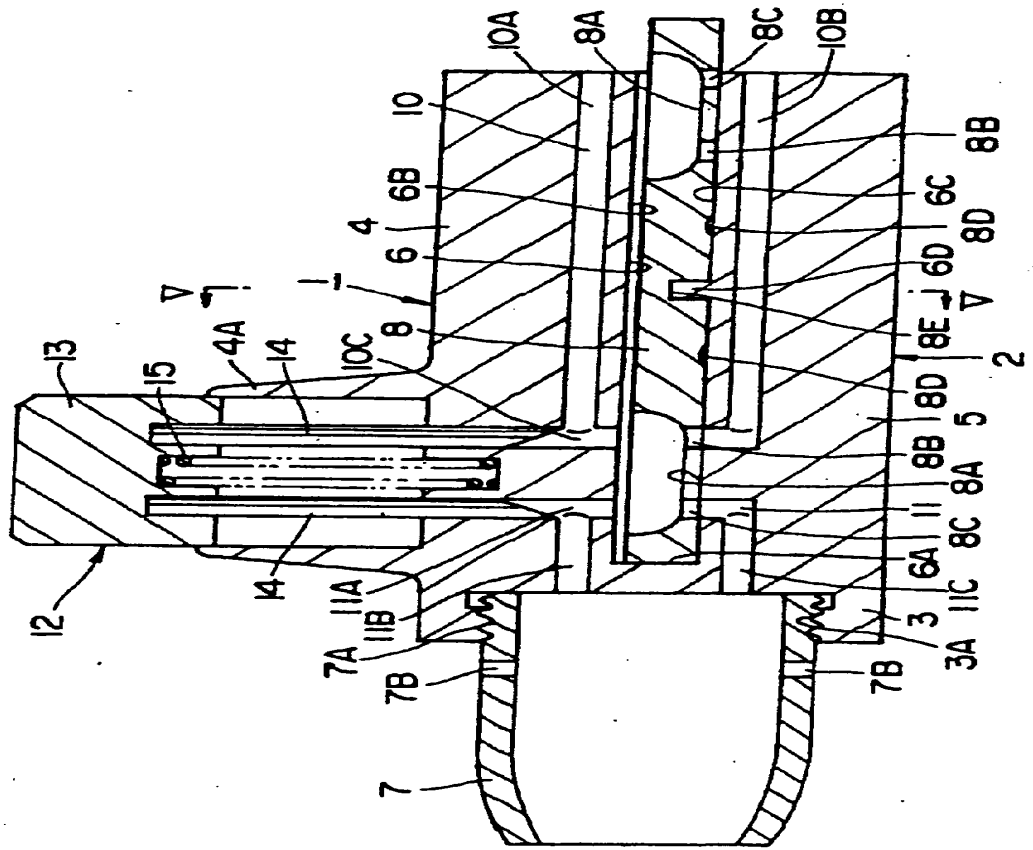
[Object] It is an object to prescribe a specified amount of medical powder, stored in a medical powder storage chamber of a blister pack, toward within lungs of a patient, while satisfactorily diffusing the medical powder stored in the medical powder storage chamber.

[Means to solve] A pricking tool 12 equipped with two piercing pins 14, 14 is installed on a medicator body 2. The inhalant medicator is configured to prick a blister pack 16 by means of the pricking tool 12. Thus, an inflow hole H1 communicating with an inflow air passageway 10 and an outflow hole H2 communicating with an outflow air passageway 11 can be formed in the blister pack 16 by the pins 14, 14 of the pricking tool 12. Turbulent flow can be created in the medical powder storage chamber 16D by way of airflow flowing and directed from the inflow hole H1 to the outflow hole H2. By virtue of the turbulent flow, the medical powder stored in the medical powder storage chamber 16D can be diffused and micronized, and whereby a specified amount of medical powder stored in the medical powder storage chamber 16D can be prescribed toward within lungs of a patient.

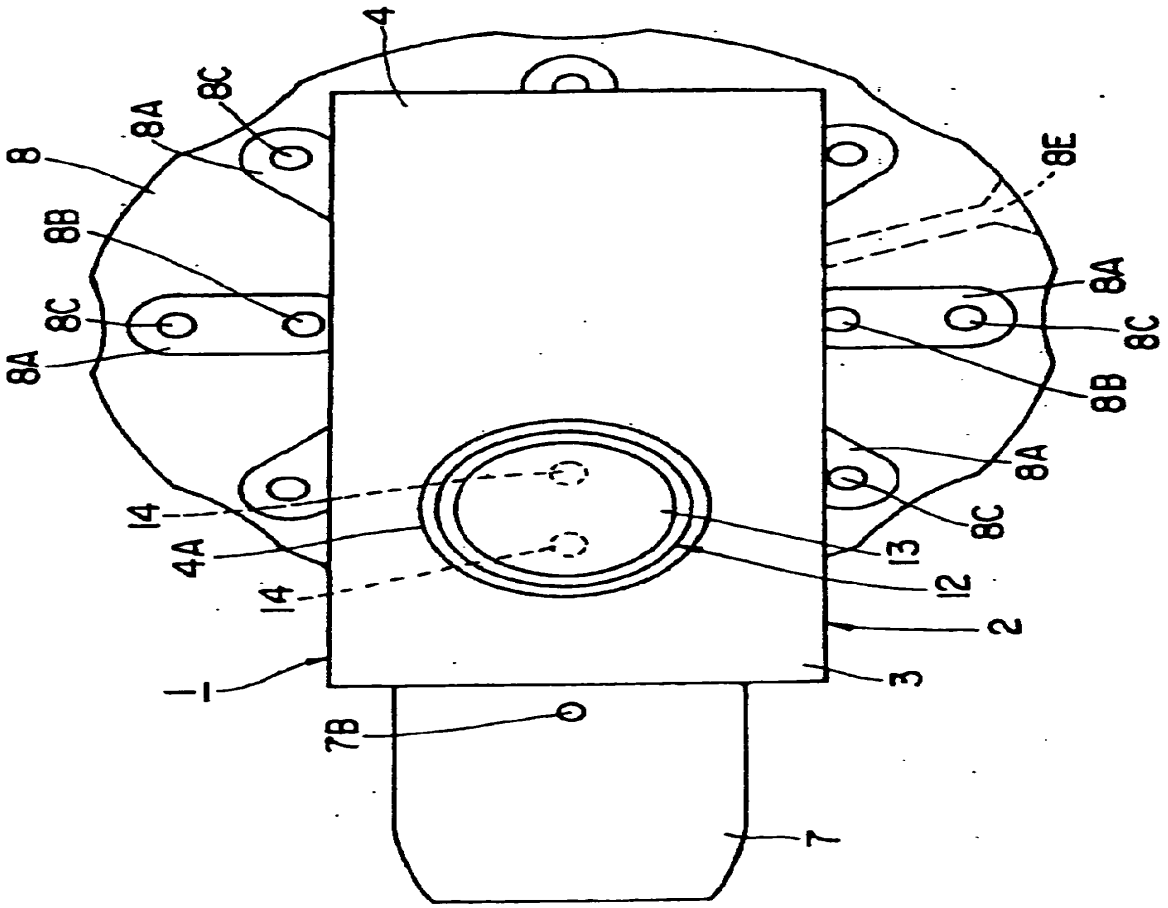
[Selected Drawing] Figure 10

[DOCUMENT NAME]　DRAWING

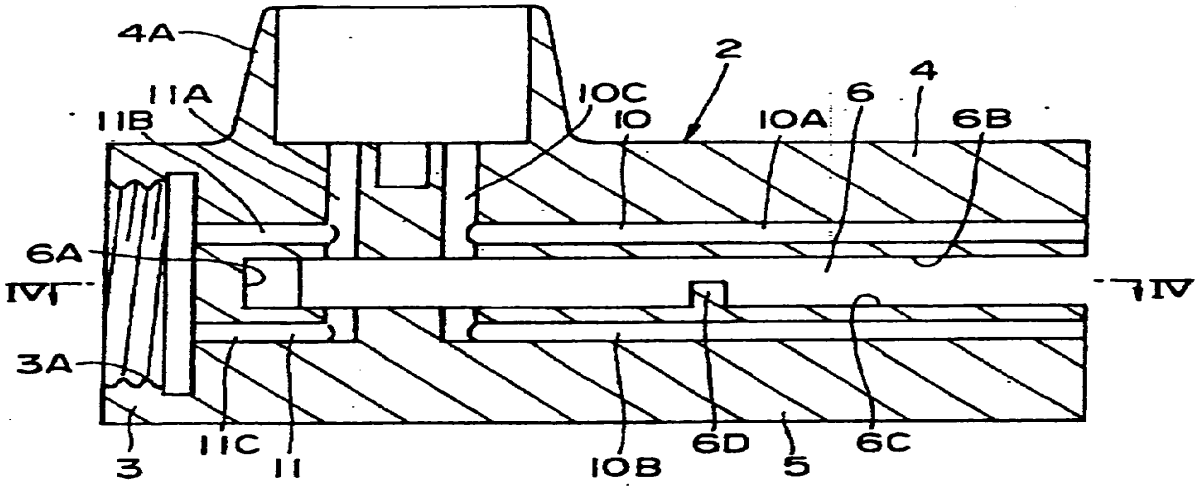
[FIGURE 1]



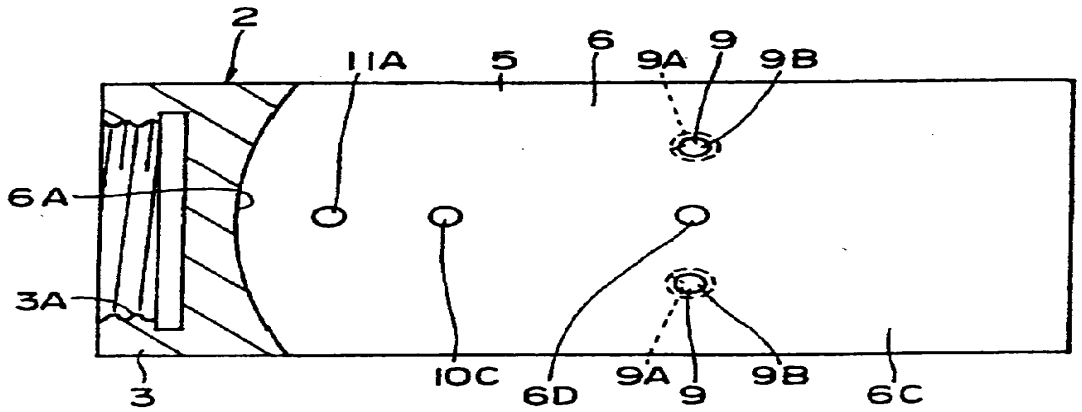
[FIGURE 2]



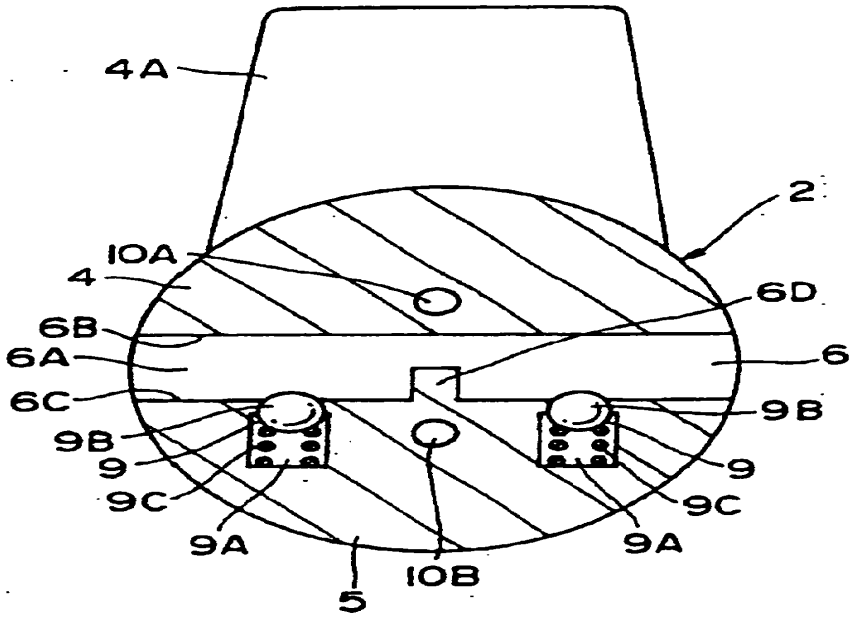
[FIGURE 3]



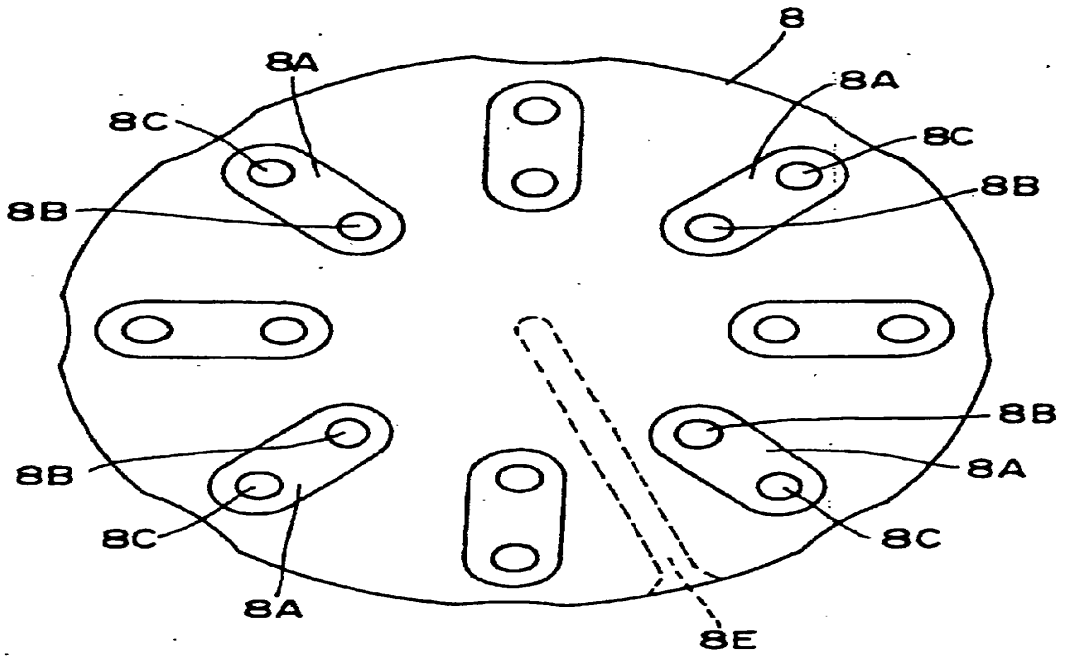
[FIGURE 4]



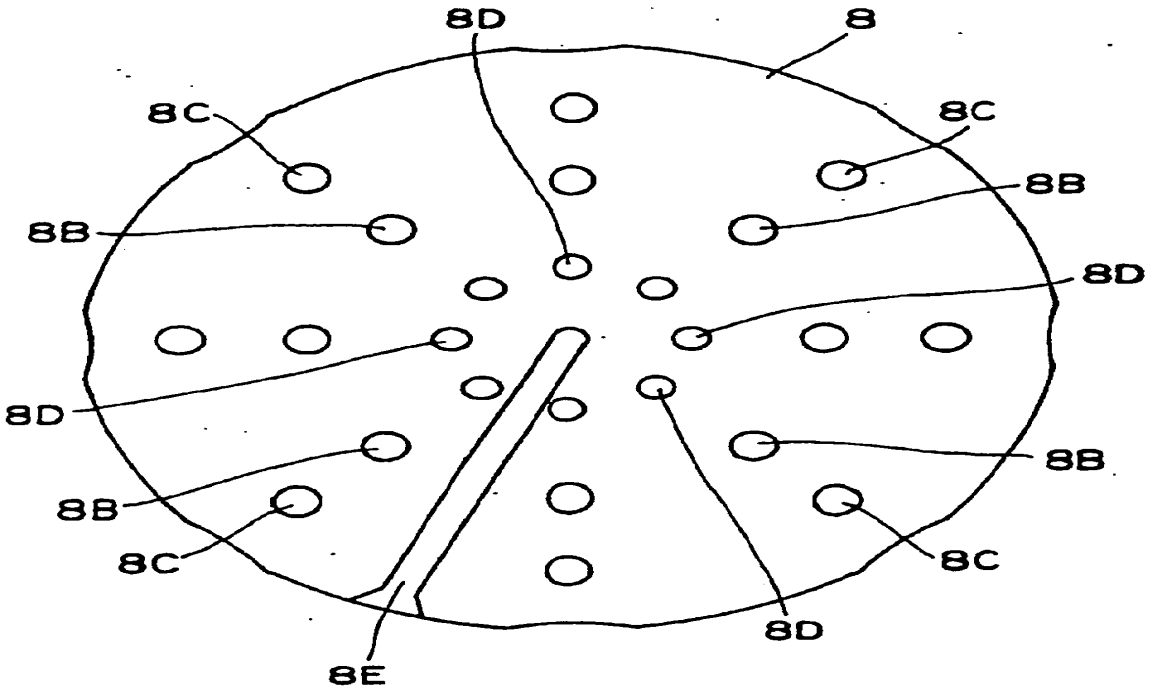
[FIGURE 5]



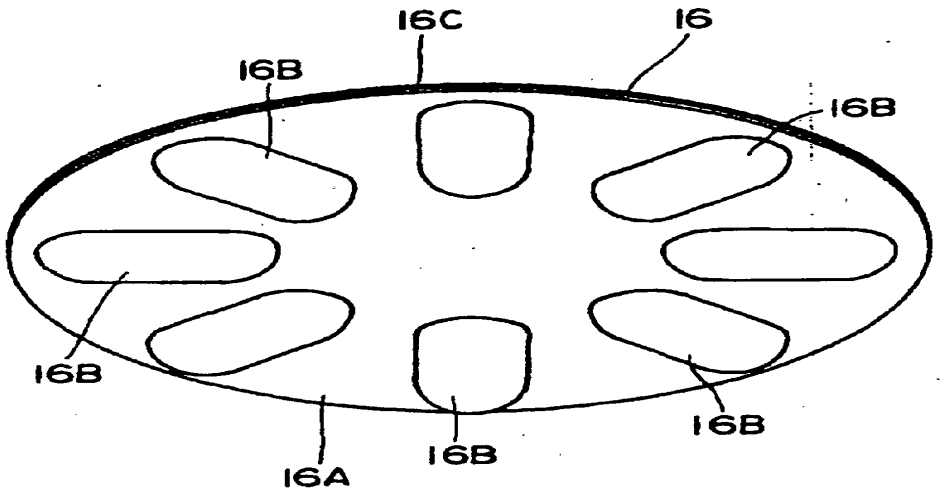
[FIGURE 6]



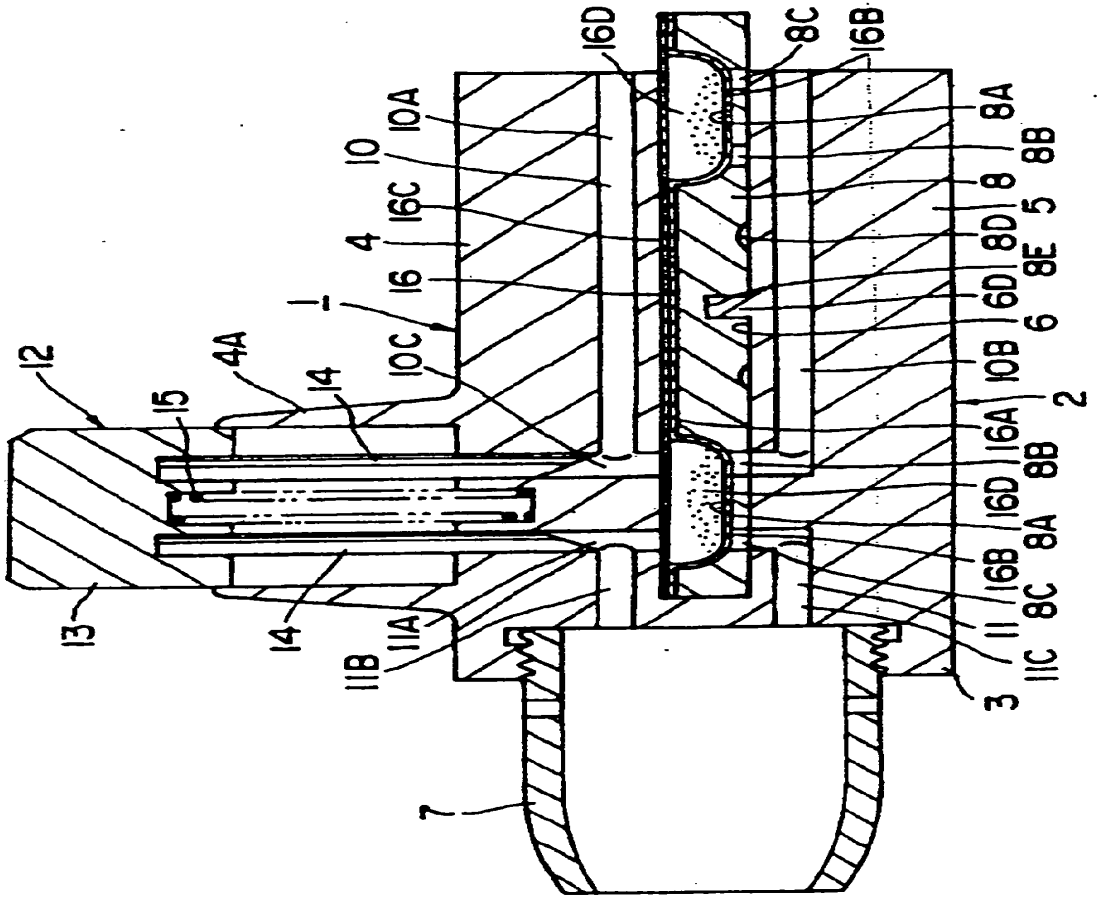
[FIGURE 7]



[FIGURE 8]



[FIGURE 9]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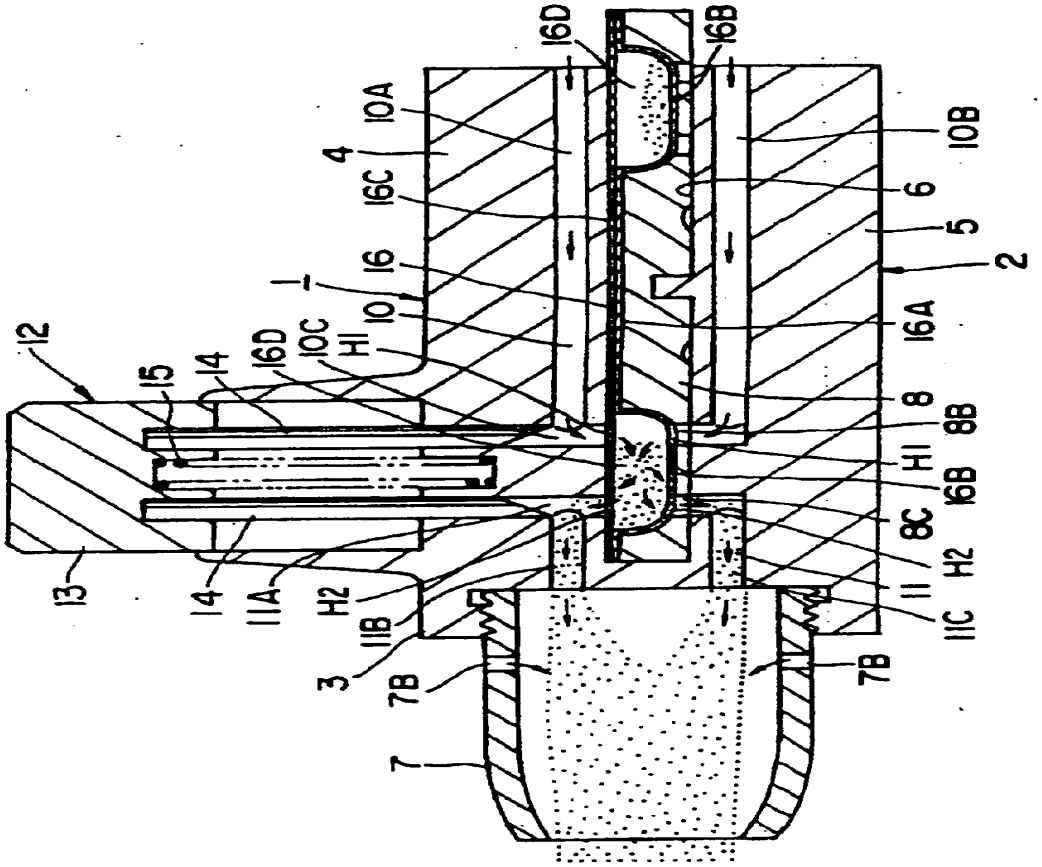
8C
16B
10A
10
16C
4
16
1
10C
12
4A
14
15
13
14
11A
11B
8A
8B
8
5
8D
8E
6D
6
10B
2
16A
8B
16D
8A
16B
8C
11
11C
3
7

[FIGURE 10]


16D
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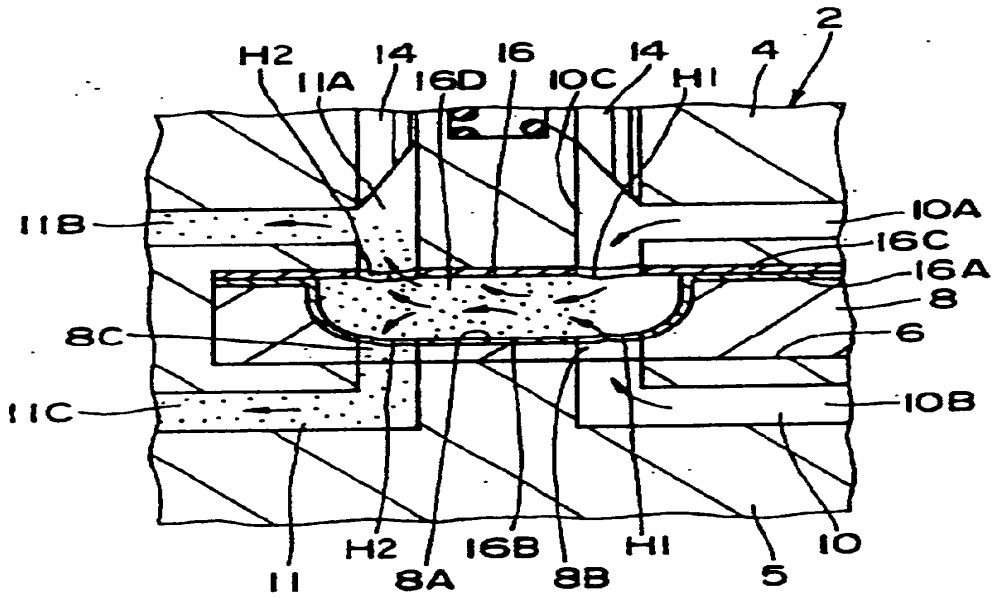
10A
10B
4
16C
6
5
2
16
1
10
16A
12
15
14
16D
10C
H1
8
8B
H1
16B
8C
11
H2
13
14
11A
H2
11B
11C
3
7B
7B
7

[FIGURE 11]


2
H2
14
16
14
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H1
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16C
16A
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10B
H2
16B
H1
10
11
8A
8B
5